fig. 2, A & B), but it does not reach the margin of the pallium. It is, however, always very near to reaching this margin; and on one side of one brain it appeared actually to do so through becoming confluent with another fissure of short length.

On the mesial surface of the brain a single fissure (fig. 5, E) is very plain anteriorly, which curves round the anterior end of the corpus callosum. This is the limbic fissure of Broca, splenial of other authors, and, I presume, calloso-marginal of still others. A very interesting little fissure was observable in the best preserved of the two brains which I bisected longitudinally. This is shown in fig. 5. At the end of the hemisphere is a short vertical fissure (A, B, C) and a shorter one still behind this, and a more faintly marked one in front. It is of course an obvious suggestion that they are the parieto-occipital and calcarine respectively.

9. Notes upon two Earthworms, *Perichæta biserialis* and *Trichochæta hesperidum*. By Frank E. Beddard, M.A., F.R.S., and Sophie M. Fedarb.

[Received June 6, 1899.]

The first of these species (*Perichæta biserialis*) was originally instituted more than twenty years ago by M. Perrier[1], whose description, however, was only in the nature of a "preliminary communication." The two matters to which he referred, viz. the disposition of the genital papillæ and the enlarged setæ on either side of the ventral median line, were sufficient at that time to fully differentiate the species.

Subsequently one of us received and described[2] some specimens of an earthworm belonging to this same genus also from the Philippine Islands; they were referred to the same species, though the entire absence of spermathecæ was noted. Upon this latter point Perrier made no observations. It was therefore concluded that it would be better to regard the worms described as being of a different species. In the 'Monograph of the Oligochaeta' therefore they were described under the name of *Perichæta acystis*. Since then Michaelsen[3] has re-described *Perichæta biserialis* very fully, and more recently still Dr. Horst[4].

Dr. Horst, whose observations where published after ours were made, examined eight mature worms from Paramaribo in Dutch Surinam: "of these two have four pairs of copulatory papillæ on

[1] "Sur les Vers de terre des Philippines et de la Cochinchine," Comptes Rendus, 1875, p. 1043.

[2] F. E. Beddard, "Observations upon an American Species of *Perichæta*, &c.," P. Z. S. 1890, p. 63.

[3] "Die Terricolen des madagassischen Inselgebiets," Abh. Senck. nat. Ges. xxxi. (1897) p. 226.

[4] "On the Variability of Characters in Perichætidæ," Notes Leyd. Mus. xx. p. 201.

segments xix.–xxii.; three of them show only three pairs on segments xix.–xxi.; one specimen has three papillæ on segments xix.–xxi. on the right side, and on segments xx.–xxii. on the left, while on both remaining forms one has only three papillæ at the right, the other one at the left side of the body on segments xix.–xxi."

The spermathecæ also are varied. Only one individual had a pair in each of segments vi. and vii. Four others had no spermathecæ at all. In the three others they were asymmetrical and as many as 3 and 5 on one side of the segment.

As our series of variations is more extensive than those recorded by Dr. Horst, we think that it will be worth while to record them. It is conceivably a noteworthy point that our specimens come from the New World, but we do not wish to lay more stress upon this fact than it will bear.

The present communication deals with 18 mature examples of an earthworm from British Guiana, which were received through the kindness of Mr. Cecil Lilley, and which show conclusively that there is no need for the retention of the species *P. acystis*. It seems to be undoubtedly identical with *P. biserialis*.

The worms were so much softened by the spirit in which they were preserved that it seems to be of no great use to give an attempt at accurate measurement of length. To mention that one specimen actually measured 475 mm. would be to give quite an erroneous idea of its size when in a moderate degree of contraction. It may be taken that these individuals were of about the same dimensions as the examples examined by Michaelsen.

The number of segments in a fair-sized specimen was 190.

The dorsal pores, as in Michaelsen's specimens, commenced between segments xii./xiii.

The setæ of this species, as already mentioned, are remarkable for the fact that the two on the ventral median line on either side of the nerve-cord are considerably larger than the others. Furthermore, the setæ of the anterior segments are all or most of them larger than those on the posterior segments, and in segments v.–viii. the four most ventral setæ are larger than the others and increase progressively up to the 7th. The setæ appear to be, for the most part, absent upon the clitellum; but in one specimen, at any rate, there was a single seta on each side of the middle ventral line of the sixteenth segment. The question of setæ upon the clitellar segments of *Perichæta* is one which requires a renewed consideration. It has been common to use the presence or absence of setæ as of specific value, but it seems to be possible, from the variations which have been recorded in some species, that setæ are really not finally present upon the clitella of many species where they exist for a short period after the formation of the clitellum. As development proceeds they drop out.

In a selected series of segments the numbers of the setæ are as follows—ii. 42, v. 60, x. 76, xii. 64, xvii. 55, xix. 60, xxiv. 60.

A few may of course have been omitted owing to their having fallen out and their apertures not noticed.

The clitellum itself seems not to occupy quite fully the first and the last of its three segments.

The second characteristic feature of this species is the arrangement and the numbers of the genital papillæ. These papillæ are paired and follow the 28th segment. The greatest number of pairs found in our examples was 5; the following numbers were also observed: 4 pairs, 3 pairs; 5 right side 4 left, 3 right 4 left, 4 right 3 left, 4 right 6 left. Perrier found as many as 7 pairs; Michaelsen not more than 5, as was the case with us.

This asymmetry of the genital papillæ, which is not by any means a novelty any more than is the varying number of pairs in individuals, is coupled with an irregularity and asymmetry of the spermathecæ. It is mainly upon this matter that we desire to lay stress in the present communication.

In first of all describing the species *Perichæta acystis* the author recorded, without commenting upon the fact, that papillæ were also present. Now in species without spermathecæ there are, as a rule, no papillæ. Not many examples occur among earthworms of species which are without these characteristic Oligochætous organs; but there are a few, among them being two species of the present genus. Dr. Rosa[1] has described *Perichæta atheca*, and Dr. Michaelsen[2] *Perichæta barami*. In the first mentioned there are no genital papillæ; in two individuals of the latter the papillæ were reduced or absent. In species of *Allolobophora*, on the other hand, there are no spermathecæ, such as *A. eiseni*, there are also no tubercula pubertatis.

Of *Perichæta atheca* Rosa examined several individuals, so that there the coincidence of absent genital papillæ and missing spermathecæ seems to be absolute. In *Perichæta biserialis*, on the other hand, spermathecæ are sometimes absent and sometimes present. Perrier makes no mention of the matter at all in his brief account of the species. Michaelsen had five examples, all of which possessed two pairs of these organs in segments vi. and vii.; the number of genital papillæ varied, as already said.

The two specimens which formed the material upon which the species *Perichæta acystis* was established had each five pairs of genital papillæ and no spermathecæ. In the present collection there are 12 specimens without and 6 with spermathecæ; but no ascertainable relation exists between the condition of the papillæ and that of the spermathecæ. We may fairly put aside *Perichæta atheca* for two reasons. In the first place, it may still be that the species is, like *P. biserialis*, sometimes with and sometimes without spermathecæ, and also for the reason that an absence of genital papillæ is so general or at least so common among *Perichæta* that it need have no significance in connection with the absence of spermathecæ. The absence, then, of any connection between

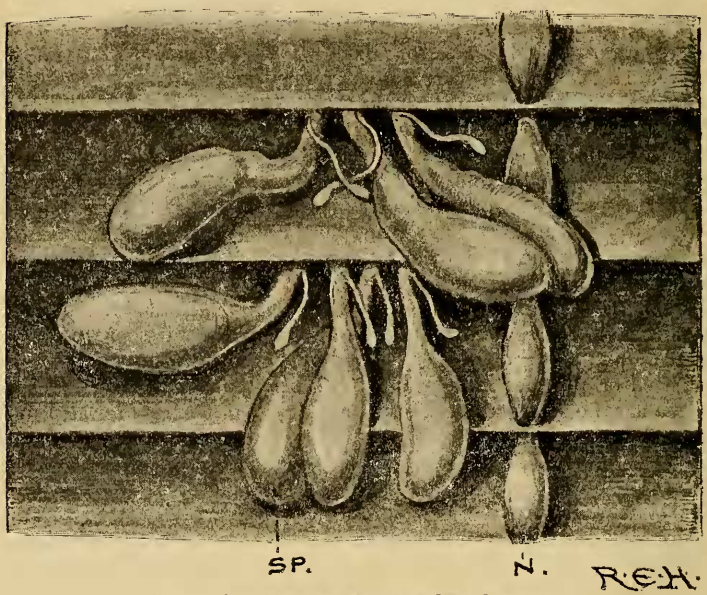
[1] "I Lombrichi raccolti a Sumatra dal dott. Elio Modigliani," Ann. Mus. Civ. Genova, xxxvi. p. 520.

[2] Oligochaeten: from Kükenthal, "Ergebnisse einer zoologischen Forschungsreise in den Molukken und in Borneo," Abh. Senck. nat. Ges. xxiii. p. 203.

genital papillæ and spermathecæ in *Perichæta* and the existence of such a connection in Lumbricidæ seems to show that physiologically the genital papillæ of *Perichæta* are different from the tubercula pubertatis of the Lumbricidæ.

Out of our examples only six had spermathecæ, and in every one of these individuals the arrangement of these was asymmetrical.

Fig. 1.



Spermathecal segments of *Perichæta biserialis*.

SP., spermathecæ; N., nerve-cord.

The following is a tabulated statement of the number and arrangement of the organs in question :—

	Segment vi.	Segment vii.
Ex. 1	3 left, 0 right.	4 left, 0 right.
Ex. 2	1 left, 0 right.	1 left, 1 right.
Ex. 3	3 left, 3 right.	0 left, 1 right.
Ex. 4	0 left, 0 right.	0 left, 1 right.
Ex. 5	0 left, 0 right.	0 left, 1 right.
Ex. 6	0 left, 2 right.	1 left, 1 right.

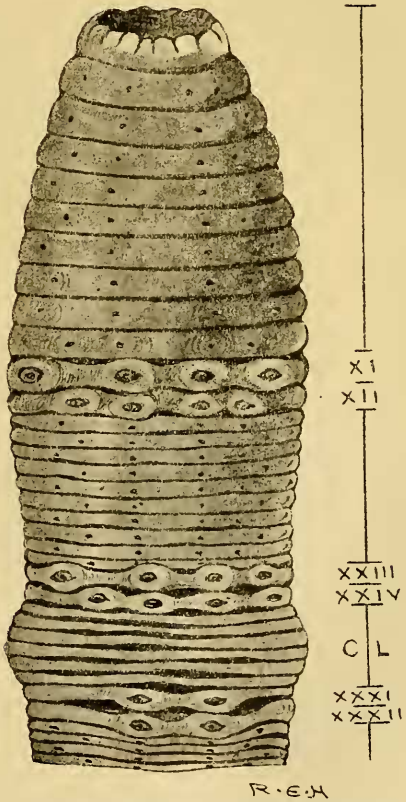
In defining the species, then, ought one to regard the presence, and if the presence, the irregularity, or on the other hand the absence, of spermathecæ as a specific character? Some variations in structure among earthworms have been already noticed; but there is only one case (perhaps two) which is so striking as that to which

we have called attention in the present communication. Those are the two species *Perionyx excavatus* and *Perichæta indica*. But in the case of the former species the number of what we may there fairly term abnormal specimens was small in proportion to those which were normal; only 18 out of about 430. In *erichæta indica* the occasional absence of the "prostate" gland is more frequent.

Trichochæta hesperidum.

The genus *Trichochæta* was founded by one of us some years since[1] and two species were described.

Fig. 2.



Trichochæta hesperidum, ventral view of anterior segment.
CL, clitellum.

[1] Beddard, "Two new Genera and some new Species of Earthworms," Quart. J. Micr. Sci. xxxiv. p. 252; and "On some new Species of Earthworms from various parts of the World," P. Z. S. 1892. p. 701.

A few specimens of this genus have been recently received from Kew Gardens through the kindness of Mr. Nicholson. Their native place is Jamaica. They evidently belong to the species *Trichochæta hesperidum*. In the description of that species there are a few lacunæ. Some of these can be filled up by additional facts derived from a study of these fresh specimens. The original,

Fig. 3.

Trichochæta hesperidum, sperm-sac.

and up to the present only, specimen of the genus was not mature. Some of the worms which we refer to in the present communication were fully mature. We are able therefore to map the clitellum, which was not developed in the former specimen.

This modified region of the integument occupies six segments,

extending from the 26th to the 31st segment. The modification of the integument, however, is only ventral; it does not die away gradually, and there is a sharp demarcation from the dorsal surface which is unmodified. The boundaries of the segments could be noticed with perfect ease in this region. The setæ, however, were not obvious.

Another external feature of some little importance, which was observed, is the presence of papillæ. They are situated ventrally, but are not perfectly symmetrical in their arrangement, inasmuch as they correspond to setæ which are themselves in this species scattered after the fashion of *Pontoscolex* and some other Geoscolecids. Of these papillæ there are 4 on each of segments xi., xii., xxiii., xxiv., and 2 on each of segments xxxi., xxxii. They are oval in form, the long axis coinciding with the transverse diameter of the body; the middle of each is higher than the periphery.

These papillæ were naturally plainer upon the mature than upon the immature examples. The setæ which lie in the middle of the areas formed by these papillæ are larger than those elsewhere, but do not appear to present any marked difference of form. We should add that the spiny tip of the setæ, on account of which the generic name was first bestowed, is not always perfectly obvious; but this may be very likely due to wear and tear.

As to internal characters, the main addition that we have to make to the original description concerns the sperm-sac. In the original non-mature example these, though long, only occupied 15 or 20 segments. In an immature example from the material now before us the sperm-sac passed back to as far as the 90th segment; in a mature example much farther, to the 119th. They thus occupy in the latter case no less than 109 segments. Their structure is thus: in segment xi. the sac commences with a dilated pouch, flattish, bigger ventrally than dorsally; in the next segment they are thinned down to a fine thread-like tube attached to the lateral walls of the intestine. About segment xxxiii. the sac dilates into a string of irregular-shaped sacs arranged without any regard to segmentation. Somewhere about segment lxxv. these irregular sacs bear numerous processes, as was figured in the paper in the 'Quarterly Journal of Microscopical Science' already referred to.

There are six thickened septa lying behind the gizzard (which is in segment vi.). No calciferous glands were seen.

We should add that the mature worm is larger than the originally described immature example. One of ours measured 113 mm. by 5 mm. in diameter.